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ABSTRACT

This review of the literature describes a number of ways in which microcomputers are being used to improve instruction. A discussion of types of software being used in instructional settings focuses primarily on the use of word processing programs by both instructors and students in writing. Descriptions of types of computer software that may be used in language learning include computer-assisted language learning (CALL) software; word processing for improving writing skills; software packages designed to improve grammar; and spreadsheets and other software that can be used to create graphs, charts, and slides to enhance oral presentations. The use of spreadsheets in financial and managerial analyses is also described, as well as the attributes and capabilities that make the computer an effective tool in teaching foreign languages. Several computer simulation games that are being used in management courses to facilitate decision making and a decision support system software package are then reviewed. A discussion of artificial intelligence highlights the development of the Expert Knowledge-Based System to help students learn management decision making skills for strategic planning in business. Advantages of online database systems and compact disks for instructors and researchers are briefly described, and a potential role for videodisks in libraries is indicated. Several ways in which schoolwork experiences with computers can be improved are suggested, and software packages that can be used in evaluating courses are briefly described. In conclusion, instructors are urged to encourage their students to exploit the tools that will increase their intellectual capabilities. Contains 26 endnotes. (ALF)

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UTILIZING TECHNOLOGY: A DECISION TO ENHANCE INSTRUCTION

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The academic curricula are being squeezed into using the personal computer (PC) in the classrooms. The survey of Theresa Barry shows that familiarity with computers of students entering colleges and universities has increased dramatically in the last few years. In 1981 about 18% of public schools had PCs, and by 1985 92% of the public schools were using PCs! (1)

The escalating number of PCs available in institutions have made the incoming freshmen more computer literate. By the time students enter their junior year college, a significant portion have facility with the computer. Henry Becker, in a major overview of educational computing, noted that from 1983 to 1985, the number of computers in high schools increased by four and the typical high school student spent twice the amount of time using PCs. (2)

EDUCATIONAL SOFTWARE

Software technology is available for application to solve a variety of educational exercises, problems, and cases in a classroom. These software include spreadsheets, word processing, spelling checkers, thesauri, grammar-checking, graphic representation, data retrieval, data manipulation, and thought processors. Computer-based tools help students to become more adept with analysis of data and become better prepared in the workplace.

In the last two decades, word processing technology has made strides on office practices and is now considered the cornerstone of office automation. Word processors have now found a place in fields where writing plays a critical role. They are virtually dominating the writer's trade. Between forty and fifty percent of all professional authors in the United States now write on computers. (3)

Advancements in software have provided instructors with diverse and powerful word processing programs and affordable desk top publishing packages. Advancements in hardware and peripherals have improved methods of storing, retrieving, and transmitting information. For teachers and students, this electronic medium seems to be affecting nearly every aspect of their writing experience from their mental state to the style and structure of their finished work.

The word processor permits both instructors and students to make changes of both form and content of their writing. These changes can be categorized as follows:

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Form:	Additions, deletions, and substitutions at word, sentence, and paragraph level.
Content:	Additions, deletions, substitutions, reordering, and rephrasing at the word, sentence, and paragraph level.

The word processor does not influence the writing style or the thought process of the writers, but rather permits them to be more efficient and productive with their own habits of composing. (4) The word processing package is also very helpful for writing up the results or recommended actions either for presentation in an oral report or in a written document or in a multimedia presentation. Not only do these packages include helpful writing tools such as spelling checker and a thesaurus, but they also relieve the writer of having to focus on the formatting when typing up the document. For more formal reports, instructors use desktop publishing package to give the impression of a polished report which includes multiple columns, pictures, and graphs.

LANGUAGE LEARNING

Computer-Assisted Language Learning (CALL) is designed as tutors, drillmasters, or toastmasters. CALL is an agent of learning and teaching and facilitates the learning of a second or foreign language. It determines the learning and the learning paths that lead to successful performance. The teaching of a language is built into design as building blocks. The learner manipulates the language learning object in abstraction of the larger content of social relationships. (5) Students may also use the software package to produce a classroom newspaper. It enables students to draft and revise their articles, create organizational documents to communicate with each other outside the classroom, and print and format the final product. This software thus creates structural changes in the organization of classroom activity, student and teacher roles, and language use.

The instrumentality of CALL is fourfold. It is a tool that supports (a) linguistic and management tasks, (b) production tasks, (c) learning tasks at the operational level of the activity system, and (d) serves as a communication device outside the classroom context. (6)

PC software are available today to enhance the student's writing skills. Most word processing programs include a spell-checking function. Another easy improvement in writing is in word choice. Several thesauri programs are integrated into several processors. The spell checking and thesauri programs vary in nature of the words, how readily they work with floppy disk and hard disk systems. (7)

Package software have also been developed to improve grammar. Grammatik and Rightwriter are writing programs to improve writing skills. They identify weaknesses in the use of passive voice, common mis-used words, and many other errors that can be detected by looking at short sets of words. By using spell checkers, thesauri programs, and grammar-

checking programs, students can improve their writing skills. Word processing enables students to write reports with neatly prepared tables, charts, and graphs. The ease of revision, change, and improvement in editing the report leads to a professionally written quality report. (8)

Package software are available to enhance oral presentations. Spreadsheets can show a variety of charts and graphics while some assist in producing free-hand drawings. Most software combine chart and graphic functions. (9) Some software can create slides, which, stored in appropriate fileboard, are presented sequentially on a TV screen or project unit. (10) Slides are relatively inexpensive and easy to produce. Using the computer software, the students can build their own slide collection. The slides are also flexible to use. One can change the viewing order as often as one likes.

In a foreign language learning setting, the slide projector is a very useful tool to practice conversation skills, work on vocabulary expressions for specific situations while preparing for role play.

THE SPREADSHEET

The computer-based spreadsheet capability has enlarged the student's horizon to grapple with large scale linguistic and/or mathematical problems. Students can use templates in the learning process associated with definitions and data. The simplification of the fundamental calculations allows students to focus on the proper interpretation of data. Students can also develop their own spreadsheet templates to analyze problems and cases requiring quantitative information.

The spreadsheet is most widely used in financial and managerial analyses. Electronic spreadsheet makes it easy to manipulate and analyze the numerical data in financial statements. They are very useful for calculating ratios, because they never make an arithmetic mistake. They also allow students to identify patterns in tables of numbers more quickly because they can display a table of numbers as a graph with just a few keystrokes. Spreadsheets are also productivity tools in that they speed up the process of preparing exhibits highlighting the key points in the analysis.

Their ability to insert rows and columns and change the width of columns simplifies the process of creating a table of numbers. Likewise, they make it very easy to quickly create a graph which highlights the key findings in a table of numbers. Spreadsheets also facilitate the use of more complex analytical models encountered by students in courses of operational research, managerial, and financial accounting. These models include breakeven analysis, pro forma financial statement projections, timelines, multiple regression equations, moving averages, and sample description statistics such as minimum, maximum, mean, and standard deviation. It is also possible to make forecast of future values of time-

series, evaluate decision trees and solve linear programs from within spreadsheet special add-on packages.

TEACHING FOREIGN LANGUAGES WITH COMPUTERS

The computer has demonstrated to be an effective tool in teaching second/foreign languages. The attributes and capabilities of a computer are: (a) Computers give instant feedback - either positive or negative - to student responses. This is probably the most important reason for using a computer in language teaching. (b) The computer is infinitely patient; no matter how many times the student makes the same error, the computer does not give up. (c) Some programs will keep track of student errors and progress - an invaluable aid to teachers. (d) Computers can provide students with self-pacing. (e) Instructors can write their own program.

To promote group interaction and to practice the command forms, the instructor needs the following materials: (a) A computer, a disk drive, and a 19" monitor. (b) A text adventure game or an authoring system that lets the instructor write his own program.

To make group interaction more efficient, the instructor should follow a set of procedures such as: (a) Explain or review the command forms; (b) Explain the premise of the adventure game and the limitations of the computer. Give examples of the types of command the computer understands; (c) Provide lists of vocabulary words that might be helpful in playing the game; (d) Encourage all the students to participate; (e) Students may suggest commands to the teacher and the teacher types them into the computer. The teacher will read the computer's responses to these commands aloud to the class. Several instructional games permit students to save the game so that they may resume at the same point the next day. (11)

COMPUTER SIMULATION GAMES

Schools use computer simulation games in management courses extensively to facilitate the decision making process. For analyzing the results of computer simulation games and larger electronic cases where there are substantial amounts of numerical information to be examined, most research facility find that it is easier to organize and select the appropriate data for analysis using a database program.

Several business schools have acquired the MACINTOSH software package to teach to students computer simulation games. At present, the MACINTOSH instructional materials limited to the instruction games are the following:

Venture's Business Simulator models. It is a study of startup company competing against

divisions from several electronics firms in the robot business. The simulation makes excellent use of the MACINTOSH desktop metaphor and mouse interface. The game starts out with a limited set of decisions and reports and adds more facets of the business as players advance to each of the four higher levels. The sequenced phase-in of complexity requires students to demonstrate competence before moving on to a higher level.

The People's Express Management Flight Simulator is a simulation game that runs only on the Macintosh. Students run a start up airline by making decisions in five key variables. The games include several feedback loops. For example, the percentage of new employees affects employee morale, productivity, and turnover. The game is distributed by its creator Prof. John Sterman of MIT's Sloan School of Management.

VIZ ECON is an introduction to key micro and macroeconomics concepts implemented by Dr. William Phillips of the University of Southern Maine. This product shows the power of HyperCard as an information presentation tool.

VICTOR is a management training computer simulation. Through the dynamics of a business management simulation, a rich and engaging experiential learning situation is created whereby students interact with each other and financial data become the primary focus for analysis and decision making. The instructional objectives of VICTOR are to provide (a) an opportunity to experience how accounting processes work and how financial statements are developed; (b) a learning experience in which students sharpen their understanding of accounting and finance by using data they create and data created by the simulation exercise; and (c) An environment to test business concepts, organizational and communication skills, analytical methods, and risk tolerances in non-threatening yet realistic situations. The areas in which students must make decision include staffing, compensation, training of personnel, payables policy, credit policies, and other management decisions. (12)

DECISION SUPPORT SYSTEMS

Some educational institutions have acquired the Expert Choice (EC), a software designed to assist a decision maker in solving complex problems in courses of marketing and management. The ability of EC is to utilize subjective judgments for one or more of the evaluative criteria in a decision making model. In order to accomplish the integration of Expert Choice as a decision support system, the instructor must become sufficiently familiar with the various functions of EC to insure that every student can examine the EC model. The instructor will project onto a large screen the EC model of each assignment.

The use of EC has helped students who in the past had consistently rejected any decision-making approach which did not utilize a quantitative approach. Utilizing EC enabled the

students to accept that certain decisions were enhanced although the criteria emphasized the qualitative aspect of the decision making process. (13)

ARTIFICIAL INTELLIGENCE

Artificial intelligence, a field of study that has traditionally included natural language processing and computer vision, has made considerable progress in the use of computers to simulate the thought process of human experts. Programs that simulate human brainpower are called "expert systems." The artificial intelligence exhibited by expert systems includes not only the ability to recall data stored in memory but heuristic knowledge as well. Heuristic knowledge consists of intuitions, judgment, and inference that, used in conjunction with factual knowledge about a subject, allows intelligent problem solving behavior.

Recently the knowledge-based (expert) systems technology has been used to help students do and learn management decision making in strategic planning and in other business areas. The knowledge-based system is an ideal tool for helping teach and learn management decision making.

The development of the Expert Knowledge-Based Systems (EKBS) is based on structural context analysis in management decision making. Courses are developed to incorporate EKBS to expose students to skills and technologies designed to enable non-technical managers to acquire EKBS skills. The course requires students to replicate strategic management decision in business areas they are familiar with, helping them to learn how to analyze a business management decision in detail, model these decisions in a way useful for creative recommendation formulation, and apply advanced technology to problems they may be facing in their business environment. The Expert Knowledge-Based Systems proves to be an excellent guide for learning cognitive modelling since they guide through the very detailed structured descriptions of decisions and provides models for doing EKBS development. The primary objective of this innovative teaching and learning technologies is to increase student job knowledge and performance. According to Professor Mockler, who authored this innovative program, students focus on developing systems to assist in EKBS development including those for (a) selecting knowledge acquisition and computer system representations appropriate for a proposed EKBS development project; (b) selecting an expert system shell or other software and hardware appropriate for an EKBS development project; (c) estimating user interface requirements and selecting interface tools for an EKBS development project; (d) doing EKBS development project feasibility studies, and (e) selecting organization structures appropriate for a proposed EKBS development project. (14)

COMPUTER EDUCATION RESEARCH

The on-line research database system has been developed to assist instructors engage in research in locating and identifying suitable materials. The data-base information systems provide several advantages to instructors:

- The on-line information system has all the necessary communications facilities;
- Multi-access is provided;
- Security of data is controlled through automatically generated back-files;
- The data-base system incorporates the ability to check the status of users to ensure that they are authorized to gain access.

Most databases for instructional materials and research allow searching on any set of characters which appear anywhere in the database. The systems are menu driven. A search is carried out by posing a question and refining it until a reasonable number of abstracts is found. The following search options are often available in asking the question:

(a) search for a single word or phrase;
(b) search for two words or phrase - both of which must be present,
(c) search for two words or phrases - either of which must be present.

On selecting one of these options, a further menu is displayed inviting the search criteria to be specified. The number of abstracts found will be displayed on the Main Menu. If too many abstracts have been found, the search criteria maybe narrowed. When an acceptable number of abstracts has been found, they can be displayed on screen by title or full abstract. Some advanced instructional database systems include supplementary teaching materials such as videos, distance learning modules, teaching packs, slides, and others. (15)

Many libraries now see electronics as their salvation: information can be stored in computers and made available around the world by means of networks that make the resources of each library available to others. Libraries of the future will store information on Optical disks. Grolier Inc. put its 21 volume, 9 million-word Academic American Encyclopedia on a single compact disk and 80 percent of the disk's capacity was left over for other materials! This encyclodisk can be used for high-speed keyword searches - just type in the subject you want information about, and the disk will come up with all references.

Videodiscs may also become a standard feature in future libraries. A video-disk dealing with birds offers many advantages over a book: for instance, the videodisc can show birds in motion (flight, feeding, courtship behavior, etc.) and recreate their vocalizations.

The world's libraries in the future will be increasingly digitized and globalized. Information from libraries will move instantaneously from library to another and from libraries to businesses, government offices, and homes. Books or articles may increasingly be printed on demand at a library, as computers and laser printers make this procedure feasible. (16)

COMPUTERS: A NEW DIMENSION IN EDUCATION

The computer in the classroom is expected to produce changes in teaching / learning practices, teachers' professional skills, and school organization. The use of computers varies probably from class to class. R. G. Ragsdale developed a model in which the teaching learning situations in a classroom may arise:

- Teaching about computers
- Teaching through computers
- Teaching with computers.

Teaching with computers refers to computer-aided instruction (CAI) programs and also to the use of computers as tools of learning. (17) Several schools have adopted the technique of teaching through computers which includes programs designed for teaching course materials in math or foreign languages. Teacher-written programs have also been developed and tailored to the specific needs of a classroom.

Goals to improve schoolwork experiences with computer may include:

(a) Developing practices in the schools which make use of computers as aids in the teaching/study;
(b) Changing the instruction itself by strengthening and increasing experiential and practical learning;
(c) enhancing the role of the students in choosing the subjects and themes to be studied, and
(d) contributing to teacher competence and student readiness to function under circumstances characterized by constant change. (18)

MICROCOMPUTER-BASED COURSE EVALUATIONS

Universities have a basic need to evaluate teaching effectiveness. The evaluation is aimed at aiding the instructor in improving professional performance in the classroom so as to enhance the learning experience. The teaching effectiveness measures are used for

performance evaluations which directly or indirectly affect compensation, tenure, and promotion decisions. (19)

Institutions of higher education use an optical mark reader (SCANTRON 52005) with the capability of reading mark-sense sheets and directly transmitting the responses to a connected microcomputer that accumulates this data in a diskette file. University microcomputer hardware and software are recommended for the data analysis to reduce costs and to utilize the talents of existing faculty who are needed to write the processing software.

The dBASE III Plus language standard allows the entire university's questionnaires to be analyzed in less than two hours. The IBM XT microcomputer can be used for both development and implementation of the system.

The Microcomputer-Based System generates several reports. A report is generated for each section showing the instructor's performance compared to the department, school, and university. The summary reports are prepared for various administrators responsible for the instructional programs. Each department head receives a summary statement comparing the performance of each departmental faculty member; the dean of each school is given a report detailing the performance of the school's faculty individually and by department, and finally the chief academic officer receives a report detailing and summarizing the results of the entire university. (20)

CONCLUSION

The development and implementation of new application of instructional technologies include the task of evaluating the impact new instructional strategies and the delivery systems have on the systematic performance of educational programs.

Knirk and Gustafson recommend the continuing monitoring and curricular integration of new interactive technologies by applying the five common elements of educational research and development:

(a) data collection,
(b) assessment of learner entry skills,
(c) specification of behavioral objectives,
(d) selection of presentation method and media, and
(e) implementation, evaluation and revision. (21)

The research of Blomeyer suggests that there may be predictable domains of influence that warrant consideration in efforts to understand the impact of new technologies on learning

which include:

(a) the design characteristics of instructional application and the interactive characteristics of computer-aided learning (CAI) applications;
(b) curricular and disciplinary sources of lesson materials;
(c) pedagogical characteristics attributable to content domain or the training of teachers as content specialists;
(d) hardware and site implementation - including logistic and technical considerations;
(e) availability or access to necessary hardware;
(f) the effects of specialized technology training on the abilities of students and teachers to use new instructional applications. (22)

The success of curricular integration of new interactive technologies depends mostly on the critical examination of the role of Computer-Aided Learning (CAL) technology by classroom teachers, curriculum specialists, and school administrators. Curricular applications should be molded so that they fit the structures of the instructional disciplines and the context of the school and community. (23)

Various teaching strategies have been suggested in the effective delivery of courses integrating new interactive technologies. Stake suggests the "responsive case-study evaluation." He describes the work of the inquirer in the following manner:

> *"He arranges for various persons to observe the program and with their help prepares brief narratives, portrayals, product displays, graphs, etc. He finds out what is of value to his audience and gathers expressions of work from various individuals whose points of view differ. Of course, he checks on the quality of his records: he gets program personnel to read to the accuracy of his portrayals, and the audience members to react to the relevance of his findings."* (24)

Another approach to evaluating new interactive technologies is the "democratic" evaluation proposed and developed by Barry MacDonald. This approach includes diverse points of view of the multiple reality of the evaluation case study. (25)

Monitoring the implementation and use of new interactive technologies is a challenging proposition. Dell Hymes proposes ethnographic research to increase the relevance and effectiveness of new educational programs. On this subject he wrote:

> *"One contribution of ethnography has to do with the planning of programs and the need for knowledge of the initial state of affairs. This contribution of ethnography (initial knowledge) is perhaps familiar, though neglected. There are two other kinds of contribution as well. One has to do with the conduct of programs, the need to recognize and understand patterns and meaning that may*

emerge during the course of a program, perhaps outside the classroom. The other has to do with the evaluation and justification of programs. The second and third contributions can be thought of as ethnographic monitoring, the one of an ongoing operation, the other of effects and consequences." (26)

Computer-aided instruction may be education's ultimate weapon in countering the lack of productivity improvement in what remains a labor-intensive industry. Instructors must encourage their students to exploit the tools that will increase their intellectual capabilities - to marshall and integrate all that is available to them. By integrating the analytical tools in the course instruction, the instructor can give students the power to extend their reasoning ability and to move with more facility to higher levels of learning.

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